

MIL-O-45445B (PA)

23 September 1976

SUPERSEDING

MIL-O-45445A (Ord)

30 September 1962

MILITARY SPECIFICATION

OCTOL

This specification is approved for use by Picatinny Arsenal, Department of the Army, and is available for use by all Departments and Agencies of the Department of Defense.

1.1 Scope.--This specification covers Octol, a high explosive intended for use as a high explosive mixture in ammunition (see 6.1).

1.2 Classification.--Octol shall be of the following types and classes as specified (see 6.2):

Type I - Octol 75/25

Type II - Octol 70/30

Class 1 - 12 efflux seconds

Class 2 - 8 efflux seconds

2. APPLICABLE DOCUMENTS

2.1 Issue of documents.--The following documents of the issue in effect on date of invitation for bids or request for proposal form a part of this specification of the extent specified herein.

SPECIFICATIONS

FEDERAL

RR-S-366 - Sieve, Test

MILITARY

MIL-T-248 - Trinitrotoluene (TNT)

MIL-H-45444- HMX

MIL-A-48078- Ammunition, Standard Quality
Assurance Provisions, General
Specification for

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Picatinny Arsenal, Dover, N.J. 07801 by using the self addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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STANDARDS

MILITARY

- MIL-STD-286 - Propellants, Solid: Sampling, Examination and Testing
- MIL-STD-650 - Explosive: Sampling, Inspection and Testing

DRAWINGS

ARMY

- 7548644 - Box, Packing for High Explosives, Assembly, Details, Packing and Marking
- 7548645 - Carton, Packing, Reusable-Collapsible for High Explosives, Assembly Details, Packing and Marking

(Copies of specifications, standards, drawings and publications required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer).

2.2 Other publications.-The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitations for bids shall apply.

AMERICAN SOCIETY FOR TESTING AND MATERIALS

- ASTM E300 - Sampling Industrial Chemicals, Standard Recommended Practice for

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Penn. 19103).

3. REQUIREMENTS

3.1 Material.-Octol, Type I and Type II, shall consist of Grade B HMX conforming to MIL-H-45444 except that 100 percent of the HMX shall pass through a Number 8, U.S. Standard Sieve. A blend of Grade A and Grade B HMX may be used provided that the mathematical weighted average of the blend's purity is 98 percent minimum. The HMX shall be thoroughly and uniformly incorporated with trinitrotoluene conforming to Type I of MIL-T-248.

3.2 Composition.—The composition of Octol shall comply with Table I when determined as specified in 4.5.1.

TABLE I

<u>Constituent</u>	<u>Type I</u>	<u>Type II</u>
HMX, percent	75.0 \pm 2.0	70.0 \pm 2.0
TNT, percent	25.0 \pm 2.0	30.0 \pm 2.0

3.2.1 The HMX, determined in 4.5.1 shall consist of HMX in the beta form only (see 6.3) when tested as specified in 4.5.1.1.1.

3.3 Properties.—The properties of Octol shall conform to requirements specified in Table II when determined as specified in applicable sub-paragraphs of paragraph 4.5.

TABLE II

<u>Properties</u>	<u>Requirements</u>	<u>Applicable Sub-paragraphs</u>
Moisture, Maximum (Max.) Percent	0.25	4.5.2
Insoluble particles		
Number (No.) of particles retained on No. 60 United States Standard Sieve, Max.	5	4.5.3
Acetone insoluble matter, Percent, Max.	0.10	4.5.4
Viscosity, efflux seconds, Max.		
Type I	15	4.5.5
Type II		
Class 1	12	4.5.5
Class 2	8	4.5.5

3.4 First Article Inspection.—This specification contains technical provisions for the first article inspection. Requirements for the submission of first article samples by the contractor shall be as specified in the contract. (see 6.2)

3.5 Workmanship.—The Octol shall be free of foreign matter such as wood, paper, metal and dirt, when determined as specified in 4.5.6. The Octol shall be in the form of buds or strips that are free flowing. No chunks that are greater than three and one half inches long, two inches wide or one quarter of an inch thick are permitted when determined as specified in 4.5.6.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection and Standard Quality Assurance Provisions.-Unless otherwise specified herein or in the contract, the provisions of MIL-A-48078 shall apply and are hereby made a part of this detail specification.

4.2 Classification of Inspections.-The following types of inspections shall be conducted on this item:

- a. First Article Inspection (see 4.3).
- b. Quality Conformance Inspection (see 4.4).

4.3 First Article Inspection (see 6.3)

4.3.1 Submission.-The contractor shall submit a first article sample as designated by the Contracting Officer for evaluation in accordance with provisions of 4.3.2. The first article shall consist of ten (10) pounds of Octol obtained by sampling as described in 4.4.3. The samples shall be obtained from a production batch which has been produced by the contractor using the same production processes, procedures and equipment as will be used in fulfilling the contract. All materials shall be obtained from the same sources of supply as will be used in regular production.

4.3.2 Inspections to be Performed.-The sample will be subjected by the Government to any or all of the examinations or tests specified in 4.4.3 of this specification.

4.3.3 Rejection.-See MIL-A-48078.

4.4 Quality Conformance Inspection

4.4.1 Inspection Lot Formation.-Inspection lots shall comply with lot formation provisions of MIL-A-48078. For the material covered by this specification, a lot shall consist of a homogeneous blend of Octol of one type and class (if applicable), only, from one or more batches, produced by one manufacturer, in accordance with the same specification, or same specification revision, under one continuous set of operating conditions. Each batch shall consist of the quantity of Octol that has been subjected to the same unit chemical or physical process. In addition, inspection lots of Octol shall contain:

- a. Type I TNT from one lot interfix number, from one manufacturer.
- b. Grade B HMX or blend of HMX from one manufacturer.

4.4.2 Examination.-Unless otherwise specified in the Classification of Defects and test tables, sampling plans for major and minor defects shall be in accordance with MIL-STD-105, Inspection Level II (See MIL-A-48078).

CLASSIFICATION OF DEFECTS & TESTS **MIL-0-45445B (PA)**

PARAGRAPH	TITLE	SHEET 1 OF 1		DRAWING NUMBER
4.4.2.1	Box, Wooden or Fiberboard, Prior to Closing			7548644 and 7548645
CATEGORY	EXAMINATION OR TEST	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE / INSPECTION METHOD
<u>Critical</u>	None defined			
<u>Major</u>				
101.	Foreign matter	0.40%	3.5	Visual
102.	Liner pierced or torn	0.40%	5.1	Visual
103.	Liner improperly closed	0.40%	5.1	Visual
<u>Minor</u>				
201.	Incorrect type of liner	0.65%	5.1	Visual
NOTES:				

CLASSIFICATION OF DEFECTS & TESTS

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PARAGRAPH	TITLE	SHEET 1 OF 1		DRAWING NUMBER 7548644	
4.4.2.2	Closed Wooden Box			NEXT HIGHER ASSEMBLY	
CATEGORY	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE /INSPECTION METHOD
<u>Critical</u>	None defined				
<u>Special</u>	DOT marking missing, incorrect or illegible		0.040%	5.1	Visual
a.	Top improperly assembled		0.40%	5.1	Visual
	Box damaged		0.40%	5.1	Visual
	Strap missing, broken or loose		0.40%	5.1	Visual/Manual
	Board broken or split		0.40%	5.1	Visual
<u>Minor</u>	Nail protruding		0.65%	5.1	Visual
	Strapping improperly assembled		0.65%	5.1	Visual/Manual
	Marking (other than DOT marking) missing, incorrect or illegible		0.65%	5.2	Visual

NOTES:

CLASSIFICATION OF DEFECTS & TESTS

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PARAGRAPH	TITLE	SHEET 1 OF 1		DRAWING NUMBER
4.4.2.3	Sealed Fiberboard Box			7548645
CATEGORY	EXAMINATION OR TEST	AQL OR 100%	REQUIREMENT PARAGRAPH	NEXT HIGHER ASSEMBLY
				PARAGRAPH REFERENCE / INSPECTION METHOD
<u>Critical</u>	None defined			
<u>Special</u> a.	DOT marking missing, incorrect or illegible	0.040%	5.2	Visual
Major 101. 102.	Assembly torn or pierced Tape Improperly applied to box seams	0.040% 0.040%	5.1 5.1	Visual Visual
Minor 201. 202.	Stitches missing or loose Marking (other than DOT marking) missing. Incorrect or illegible	0.065% 0.065%	5.1 5.2	Visual/Manual Visual
NOTES:				

4.4.3 Testing

4.4.3.1 Sampling.—Two samples, one quart each, shall be taken from each batch. The samples shall be collected as the material discharges from the casting belt.

Collect the first sample during the first half of the production run. Start collecting the material at the beginning of the production run. The material shall be collected at approximately equal time intervals, in approximately equal amounts, throughout the duration of the first half of the production run. Mix the resulting sample thoroughly. In a similar manner, collect another sample during the second half of the production run. The last collection of the material, for this sample, shall occur during the final phase of the production run.

Test samples from each sample shall be subjected to the tests of paragraph 4.5. If any test sample fails to meet the applicable requirements (paragraph 3), the batch shall be rejected. The classification for the tests shall be as given in Table III.

TABLE III

<u>Inspection/Requirement</u>	<u>Defect Classification</u>
Composition (see 3.2)	Major
Moisture (see 3.3)	Major
Insoluble Particles (see 3.3)	Major
Acetone Insoluble Particles (see 3.3)	Major
Viscosity (see 3.3)	Major
Workmanship (see 3.5)	Minor

4.4.4 Inspection Equipment.—The government reserves the right to inspect the contractor's equipment and determine that he has available and utilizes correctly, measuring and test equipment of the required accuracy and precision and that the instruments are of the proper type and range to make measurements of the required accuracy. Commercial inspection equipment shall be employed where applicable for all tests and examinations specified in 4.5. The contractor is responsible for assuring that proper calibration procedures are followed. Government approval of all inspection equipment is required prior to its use for acceptance purposes (see 6.4).

4.5 Test Methods and Procedures (see 6.5).—The tests in 4.5.1 through 4.5.6 shall be performed using prescribed analytical procedures for replicate determinations given in standard analytical textbooks.

4.5.1 Determination of Composition

4.5.1.1 HMX Content.—Weigh approximately a 10 gram portion of the sample to the nearest 0.001 gram. Transfer the sample to a 50 ml beaker and add 30 ml of hot benzene solution (approximately 50°C) saturated with RDX and HMX. Cover the beaker with a watch glass and place on a steam hotplate. (or steam bath and maintain a glass rod and occasionally stir the solution. Accurately weigh a clean dry filtering crucible which was previously heated to 100° + 5°C. Remove the beaker from the steam hotplate and stir the contents to insure TNT is in solution. Allow the contents of the beaker to cool to ambient temperature. Place the previously weighed crucible on a vacuum flask and apply vacuum. Stir the sample, then rinse the explosives from the stirring rod and watch glass into the crucible using the saturated benzene solution from a wash bottle. Filter the liquid through the crucible, rinse the beaker and then wash the residue with two 5 ml portions of the saturated benzene solution. Filter all the liquid from the sample and place the crucible and contents in the steam heated dryer (or steam heated oven) until dry (10-30 minutes). Remove the crucible from the heat source, allow it to cool to ambient temperature and weigh. Calculate the percentage of HMX as follows:

$$\text{Percent HMX} = \frac{100A}{W}$$

Where:

A = weight of residue, grams

W = weight of sample on a moisture free basis, grams

4.5.1.1.1 HMX analysis for presence of alpha HMX.—The HMX obtained in 4.5.1.1 shall be used for this determination. Examine the HMX for the presence of alpha HMX using X-ray diffraction as described in paragraph 4.3.1.1 of MIL-H-45444B.

4.5.1.2 TNT Content.—The TNT content shall be determined by difference. The percentage of HMX (see 4.5.1.1) shall be subtracted from 100 percent.

4.5.2 Determination of Moisture-Karl Fischer Method (see 6.6).—Determine the moisture content in accordance with Method 101.5 of MIL-STD-286. The special solvent in this determination shall consist of equal volumes of anhydrous methanol and benzene thoroughly mixed. If necessary, the solvents shall be dried by distillation. (see 6.7)

4.5.3 Determination of Insoluble Particles.—Accurately weigh a sample of approximately 50 grams (on a dry weight basis) and quantitatively transfer the sample to a one (1) liter beaker. Add 400 ml of hot acetone (approximately 50°C) to the beaker. Place a stirring rod in the beaker, cover with a watch glass and heat the contents of the beaker on

a steam heated hot plate (or steam bath) with periodic stirring. Let the sample remain on the steam heated hot plate until all of the explosives are in solution. If all the explosives do not go into solution, additional hot acetone may be added. Pour the mixture through a small U.S. Standard No. 60 sieve conforming to RR-S-366 and carefully collect all the filtrate in a beaker. Quantitatively transfer the residue from the beaker to the sieve with acetone, and collect the acetone in the beaker containing the filtrate. Then, wash the sieve with the acetone to remove any remaining traces of explosive, and again collect the acetone in the filtrate beaker. Dry the sieve. Count and examine any particles retained on the sieve. The filtrate and the residue shall be used for the acetone insoluble matter determination as specified in 4.5.4.

4.5.4 Determination of Acetone Insoluble Matter.—Accurately weigh (to the nearest .0001 gram) a clean dry filtering crucible. Place the crucible on a vacuum flask and apply vacuum. Quantitatively transfer the filtrate collected in the insoluble particle determination (paragraph 4.5.3) into the crucible using acetone from a wash bottle to rinse the beaker. Quantitatively transfer all insoluble particles retained on the U.S. Standard No. 60 sieve from the insoluble particle determination into the filtering crucible. Wash the crucible thoroughly with acetone from a wash bottle to remove any traces of explosives. Filter all liquid from the sample, then dry the crucible in the steam heated dryer or steam heated oven (10 to 30 minutes). Remove the crucible from the heat source and allow to cool to ambient temperature. Accurately weigh the crucible and calculate the percentage of acetone insoluble material as follows:

$$\begin{array}{l} \text{Percentage, acetone} \\ \text{insoluble material} \end{array} = \frac{R \times 100}{W}$$

Where:

R = weight of residue, grams

W = weight of sample used for insoluble particle test, grams

4.5.5 Determination of Viscosity.—The viscosity shall be determined in accordance with Method 212.1 of MIL-STD-650 except that the material must be held in the melt pot until all of the sample melts.

4.5.6 Workmanship.--Visually examine the material at least twice during a production run to determine compliance with workmanship and form requirements as specified in 3.5.

5. PREPARATION FOR DELIVERY

5.1 Packing - (see 6.2)

5.1.1 Level A.--The Octol shall be packed in wooden boxes in accordance with dwg. 7548644.

5.1.2 Level B.--The Octol shall be packed in fiberboard cartons in accordance with dwg. 7548645.

5.2 Marking.--Marking shall be in accordance with dwg. 7548644 and 7548645.

6. NOTES

6.1 Intended Use.--Octol is intended for use as a high explosive in warheads.

6.2 Ordering Data.--See MIL-A-48078. Procurement documents should also specify the type and class (if applicable) of Octol required.

6.3 Holston Defense Corporation's, Standing Operating Procedure (SOP) 1510-1900-F for the manufacture of Octol should not result in the polymorphic conversion of beta HMX to the alpha HMX form. Therefore, Octol manufactured using this procedure does not have to be tested for the presence of alpha HMX (see 3.2.1). However, if any of the following pressures and temperature, as stated in SOP-1510-1900-F, are elevated:

- a. incorporation kettle jacket pressure of 15 psig, max.
- b. temperature of Octol in incorporation kettle, 105°C max.
- c. hold up kettle pressure of 5 psig, max.

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the first five (5) batches of Octol produced by the modified procedure shall be tested for the presence of alpha HMX, as described in 4.5.1.1.1. If any batch exhibits the presence of alpha HMX, that batch shall be rejected and every subsequent batch of Octol produced by the modified process shall be examined for the presence of alpha HMX.

This precaution is being dictated because current studies indicate polymorphic conversions at higher temperatures.

6.4 Submission of Inspection Equipment Designs for Approval.-
See MIL-A-48078. Submit equipment designs, as required to Commander, Picatinny Arsenal, ATTN: SARPA-QA-T, Dover, New Jersey 07801.

6.5 Prior approval of the Contracting Officer is required for use of equivalent test methods. A description of the proposed method should be submitted through the Contracting Officer to: Commander, Picatinny Arsenal, ATTN: SARPA-QA-A-P, Dover, New Jersey 07801. This description should include but not be limited to the procedures used, the accuracy and precision of the method, test data to demonstrate the accuracy and precision and drawings of any special equipment required.

6.6 Moisture Determination.-Analytical Standard Method Number C-3 dated 4 October 1971 by the Holston Defense Corporation may be used in place of the Moisture Determination as specified in 4.5.2. Any other method must be approved by Picatinny Arsenal, Dover, New Jersey 07801, ATTN: SARPA-QA-A-P prior to use.

6.7 The Karl Fischer method given in MIL-STD-286 was chosen because it is considered a better method for this material.

Custodian:
Army-PA

Preparing Activity:
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